Abstract

A semiconductor substrate is disclosed having a given horizontal cross-section, a first region defined in a first portion of the given horizontal cross-section of the substrate, and a second region defined in a second portion of the given horizontal cross-section of the substrate, the second region adjacent to and integral with the first region, a first given plurality of quantum wells formed in the first region, the first given plurality of quantum wells having a first given bandgap, and a second given plurality of quantum wells formed in the second region, the second given plurality of quantum wells having a second given bandgap, wherein the first given bandgap is less than the second given bandgap. A semiconductor structure is disclosed comprising a semiconductor substrate having a given horizontal cross-section, a first section defined in one portion of the given horizontal cross-section of the substrate, and a second section defined in another portion of the given horizontal cross-section of the substrate; a first plurality of quantum wells formed in the first section, the first

plurality of quantum wells having a given bandgap; a second plurality of quantum wells formed in the second section, the second plurality of quantum wells modified by depositing a dielectric cap on the second section, and rapid thermal annealing of the dielectric cap for a given time and at a given temperature, so as to tune the second plurality of quantum wells to a tuned bandgap; wherein the tuned bandgap is greater than the given bandgap. A semiconductor substrate is disclosed comprising a single semiconductor wafer having a first end and a second end in opposition to one another, and a longitudinal axis formed between the first end and the second end; a plurality of quantum wells formed in the single semiconductor wafer between the first end and the second end, a first section of the plurality of quantum wells having a first given bandgap, and a second section of the plurality of quantum wells having a second given bandgap; wherein the second given bandgap is greater than the first given bandgap. A method for forming a semiconductor substrate is provided, the method comprising providing a single semiconductor wafer

having a first end and a second end in opposition to one another, a longitudinal axis formed between the first end and the second end, a top surface and a bottom surface in opposition to one another, a plurality of quantum wells disposed in the semiconductor wafer, and the plurality of quantum wells having a given bandgap; depositing a first dielectric cap on a first given portion of the top surface of the single semiconductor wafer; and rapid thermal annealing of the first dielectric cap deposited on the top surface of the single semiconductor material to tune the plurality of quantum wells disposed beneath the first dielectric cap from the given bandgap to a first tuned bandgap; wherein the first tuned bandgap is greater than the given bandgap.

A semiconductor structure is disclosed comprising:

a semiconductor substrate having a given horizontal cross-section, a first section defined in one portion of the given horizontal cross-section of the substrate, and a second section defined in another

portion of the given horizontal cross-section of the substrate;

a first plurality of quantum wells formed in the first section, the first plurality of quantum wells having a given bandgap;

a second plurality of quantum wells formed in the second section, the second plurality of quantum wells modified by depositing a cap on the second section, and rapid thermal annealing of the cap for a given time and at a given temperature, so as to tune the second plurality of quantum wells to a tuned bandgap;

wherein the tuned bandgap is greater than the given bandgap.

A method for forming a semiconductor substrate is disclosed, the method comprising:

providing a single semiconductor wafer having a first end and a second end in opposition to one another, a longitudinal axis formed between the first end and the second end, a top surface and a bottom surface in opposition to one another, a plurality of quantum wells disposed in the semiconductor wafer, and the plurality of quantum wells having a given bandgap;

depositing a first cap on a first given portion of the top surface of the single semiconductor wafer; and

rapid thermal annealing of the first cap deposited on the top surface of the single semiconductor material to tune the plurality of quantum wells disposed beneath the first cap from the given bandgap to a first tuned bandgap;

wherein the first tuned bandgap is greater than the given bandgap.